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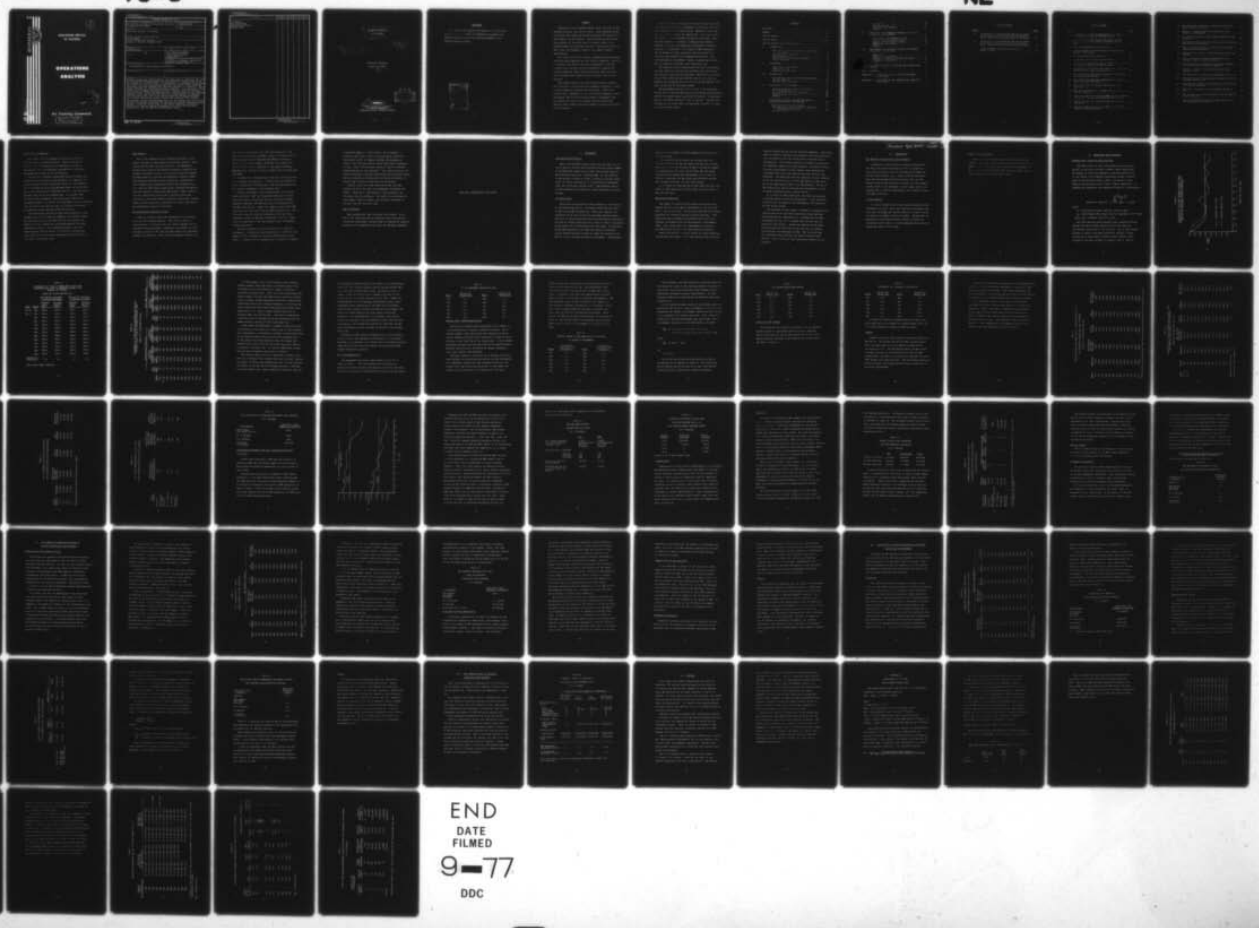

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NON-PRIOR SERVICE
'W' PATTERN

OPERATIONS ANALYSIS

Air Training Command

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13. ABSTRACT

Specific objectives established for the study were to determine the cost of fluctuations and seek practical alternatives to minimize the peaks and valleys of the "W" Pattern. Fluctuations of a seasonal nature affect the flow of new enlisted recruits into the Air Force. These seasonal variations have been labeled the "Non-Prior Service 'W' Pattern." This report examines the recruiting/training tradeoff. Five recruiting flow patterns are compared according to their relative impact on training and recruiting. These flow patterns are: optimum flow for the training community (with and without BMT and TT Christmas breaks); programmed flow for Fiscal Year (FY) 1977; optimum flow for Recruiting Service; and a highly fluctuating pattern called the Historical "W" Pattern.

The analysis clearly demonstrates that both the optimum flow for Recruiting Service and the Historical "W" Pattern are inferior recruiting flow options. Selection of the best of the three remaining alternatives reduces to a toss-up between programmed flow for FY 1977 and BMT Optimum flow with the BMT and TT Christmas breaks.

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ABSTAINER

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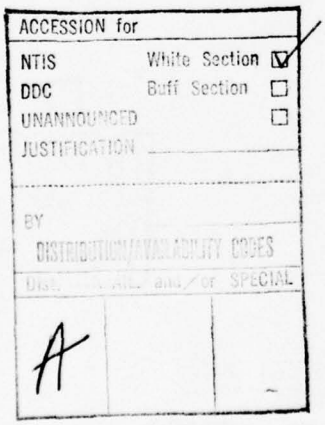

SUMMARY

Fluctuations of a seasonal nature affect the flow of new enlisted recruits into the Air Force. These seasonal variations have been labled the Non-Prior Service "W" Pattern or, more simply, the "W" Pattern. When secondary schools graduate students in June and again in January, there is an abundant supply of potential recruits. During the months of April, May, and December, however, the supply dwindles dramatically.

As a result of the "W" Pattern, tradeoffs develop between the recruiting community and the training community. Recruiting Service (RS) desires to recruit according to the "W" Pattern which reflects recruit availability, whereas the training agencies, Basic Military Training (BMT) and Technical Training (TT), prefer to have a smooth flow of new recruits.

This report examines the recruiting/training tradeoff. Five recruiting flow patterns are compared according to their relative impact on training and recruiting. These flow patterns are: optimum flow for the training community (with and without BMT and TT Christmas breaks); programmed flow for Fiscal Year (FY) 1977; optimum flow for Recruiting Service; and a highly fluctuating pattern called the Historical "W" Pattern.

Specific areas or functions in the recruiting and training arenas are examined to determine the relative effects of alternative recruiting flow options. Because of data limitations, not all effects are quantified. Those areas where the impact could be measured include the following: Basic Military Training -- manpower, transportation, medical support, utilities, and management adjustments; Technical Training -- comparison of the supply of BMT graduates to the TT demand for those graduates; Recruiting Service -- recruiter requirements and management adjustments. The term "management adjustments" refers to managerial actions such as requiring overtime, leave shuffling, etc.

The analysis clearly demonstrates that both the optimum flow for Recruiting Service and the Historical "W" Pattern are inferior recruiting flow options. Selection of the best of the three remaining alternatives reduces to a toss-up between the programmed flow for FY 1977 and BMT Optimum flow with the BMT and TT Christmas breaks.

The programmed flow for FY 77 is felt to be marginally better than the optimum BMT flow with Christmas breaks because the FY 77 Program, being a modified "W" Pattern, incorporates many of the known features of the "W" Pattern. Optimum flow for BMT, on the other hand, includes some "unknowns" in that it is an untried system.

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List of Acronyms and Abbreviations

AFB	Air Force Base
AFMTC	Air Force Military Training Center
ANG	Air National Guard
AR	Air Force Reserve
ATC	Air Training Command
ATC/CC	Commander of Air Training Command
BMT	Basic Military Training
BOS	Base Operating Support
DDA	Directed Duty Assignments
DEP	Delayed Enlistment Program
FY 77	Fiscal Year 1977
FY 7T	Fiscal Year 1977 Transition. July 1976 through September 1976
MTI	Military Training Instructor
OJT	On Job Training
PTTS	Pre-Technical Training Students
RPMA	Real Property Maintenance Activities
RS	Recruiting Service
TDY	Temporary Duty
TPR	Trained Personnel Requirements
TT	Technical Training
TTC	Technical Training Center

I. INTRODUCTION

Non-Prior Service "W" Pattern - Definition and Impact

The Air Force has traditionally experienced seasonal fluctuations in the flow of new enlisted recruits. This pattern of fluctuations, the Non-Prior Service "W" Pattern, is driven by high school graduations and the Christmas holiday season. Hence, peaks in recruiting flow occur during the summer and early winter whereas valleys occur in the spring and late fall.

Since Air Force training programs operate on a year-round basis with course start dates occurring daily, the impact of the Non-Prior Service "W" Pattern, hereafter called the "W" Pattern, on training and recruiting operations is significant. If Air Training Command (ATC) desires to recruit new enlistees as they become available, the resultant variations in training loads would necessitate peak loading adjustments which would increase training costs. On the other hand, stabilizing the training load would increase recruiting costs since additional recruiters and/or advertising would be necessary to attract enlistees during the difficult recruiting months of December, April, and May. Selection of an optimum recruiting pattern, then, requires an examination of the recruiting/training tradeoffs.

Objectives and Approach

This report, which examines the training/recruiting tradeoff, was initiated by ATC/CC. Specific objectives established for the study are to determine the cost of fluctuations and seek practical alternatives to minimize the peaks and valleys of the "W" Pattern.

Because cost tradeoffs (recruiting versus training) are inherent in all recruiting flow patterns, the approach to accomplishing the above objectives involves a cost comparison of alternative recruiting patterns based on the FY 1977 recruiting objective of 76,000 new recruits. The recruiting patterns that are to be compared are: (1) optimum flow for the training community (with and without BMT and TT Christmas breaks), (2) the FY 1977 Programmed flow, (3) optimum flow for Recruiting Service, and (4) a highly fluctuating flow pattern called the Historical "W" Pattern.

The methodology employed to make these comparisons uses optimum flow for the training community, specifically Basic Military Training, as the baseline flow and compares the baseline to each alternative recruiting pattern on a cost differential basis. This approach provides a means of assessing the relative merits of recruiting alternatives while spanning the recruiting spectrum from smooth flow to the highly fluctuating flow.

Data Sources

All of the comparative cost analyses provided in this report are based on data supplied by diverse sources. These sources and the data each provided are: ATC Management Analysis--pay factors; ATC Manpower--manpower equations and command programming factors; ATC Technical Training--demand for BMT graduates; Lackland AFB Management Analysis--AFMTC base population and BMT student population; Lackland AFB Civil Engineering--transportation data and estimated utilities costs for BMT student dormitories; Lackland AFB Medical Services--impact of fluctuating BMT student loads on medical services; Recruiting Service--FY 77 monthly recruiting objectives, historical monthly recruiting objectives, average number of new accessions a recruiter can recruit each month, and average pay grade of a recruiter.

Definition/Clarification of Terms

There are several terms used repeatedly in this report which are not self-explanatory. The first of these is "training day." A training day is a normal workday for the specified training program. Generally, the number of training days is equal to 365 (366 for leap years) less Saturdays, Sundays, and holidays. Some training programs, however, may

have fewer training days than other programs due to the granting of additional holidays. Such a difference exists between Basic Military Training and Technical Training. During the Christmas season, TT allows the students four to seven days leave in addition to the normal holidays; BMT does not. Thus TT has four to seven fewer training days than BMT.

In addition to "training day," the term "training month" also requires clarification. A training month consists of twenty consecutive training days. The training month will not usually correspond to the calendar month.

Similar in meaning to the "training day" is the term "BMT input day." BMT input days are those days on which Recruiting Service sends new recruits to basic training. Generally speaking, the BMT input day is synonymous with the BMT training day. There are, however, seven fewer BMT input days per year than there are BMT training days. This difference results from two Christmas holiday policies, hereafter called the BMT and TT Christmas policies. Each policy is explained in the next section under the heading "Recruiting Flow."

The term "monthly recruiting objective" can also be misleading. The monthly recruiting objective refers to the number of new enlistees to be sent to BMT during a given month. It should not be confused with the number of "sells"

a recruiter makes in a given month. As an example, a recruiter can "sell" a slot in a given career field to a high school senior in January although the prospective recruit will not enter the Air Force until after graduation in June. Thus, the recruiter records a "sell" in January toward meeting his June objective. This type of action, the delayed enlistment, provides Recruiting Service greater flexibility in meeting its objectives than would be possible if "sells" had to occur in same month as enlistment.

Finally, there are three terms which have the same meaning and which are used interchangeably throughout the report. These are: "new recruit," "new enlistee," and "non-prior service enlistee." All refer to an enlisted Air Force member, male or female, who is being introduced to military life for the first time.

Use of Acronyms

Many acronyms are used throughout this report. As an aid to the reader who may be unfamiliar with training and recruiting terminology, acronym usage is tempered by frequent recourse to the compound terms which the acronyms represent.

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II. BACKGROUND

Training the New Recruit

When a new enlisted recruit enters the Air Force, he or she is sent to the Air Force Military Training Center (AFMTC) at Lackland AFB, Texas for six weeks (32 training days) of Basic Military Training. Following BMT, the new enlistee or new recruit is sent to either a technical training center (TTC) for formal training or to a directed duty assignment (DDA) for on-the-job training (OJT). Approximately 94% of all BMT graduates are enrolled in formal technical training courses.

Recruiting Flow

Recruiting new enlisted Air Force members is the function of the Recruiting Service. RS usually sends new enlistees to BMT on each BMT training day. There are, however, two exceptions which occur during the Christmas holiday season. The first of these exceptions results from Technical Training's practice of ceasing operations for a four to seven training day period during the Christmas-New Year time frame. To preclude having BMT graduates in an "awaiting technical training" status, Recruiting Service does not input new enlistees into BMT for a five training day period in November. The November

time frame corresponds with BMT graduations during the TT Christmas break.

The second exception occurs on the day before the Christmas holiday and the day before the New Year holiday. Since the new recruit arriving at BMT is primarily engaged in in-processing activities on his first day and begins training on the second day, BMT prefers not to have new recruits in-process the day before the Christmas and New Year holidays and then "sit out" the holiday.

As a result of these BMT and TT Christmas policies, the number of BMT input days is seven fewer than the number of BMT training days.

Recruiting Objectives

The number of recruits which Recruiting Service must procure for entry into BMT is determined at the Air Staff level. Each fiscal year, the Air Staff provides RS a yearly objective for non-prior service enlisted personnel. This recruiting goal is based on projected end-of-year force strength requirements and trained personnel requirements (TPR). This yearly goal also compensates for attrition from BMT as well as attrition from Technical Training.

Recruiting Service, in turn, breaks the yearly objective into monthly objectives. It is this process that generates

conflict between RS and the ATC Training Community. Recruiting Service naturally desires to set monthly recruiting objectives that correspond to the "W" Pattern which reflects recruit availability. The training community, however, desires that RS establish a smooth flow input pattern. The Basic Military Training establishment is most adamant about maintaining a constant flow since they must process and train all new enlistees. The Technical Training community is also affected by the "W" Pattern but not to the same degree as BMT since TT trains approximately 94% of all BMT products. The 6% of BMT products who receive directed duty assignments in lieu of formal training provide a buffer for TT.

As a result of these conflicts, care must be exercised in setting monthly recruiting objectives. A cost effective situation for one agency is not necessarily cost effective for the entire system.

The remainder of this report is devoted to comparing the relative merits of alternative recruiting input patterns. Those selected for comparison are: optimum flow for BMT; programmed flow for FY 77; optimum flow for RS; and the Historical "W" Pattern. Because the BMT and TT Christmas policies influence the flow of new recruits, two optimum flow patterns are developed for BMT. The first excludes the Christmas policy effects; the second includes these effects. Thus, a total of five recruiting options will be analyzed.

III. ASSUMPTIONS

Air National Guard and Air Force Reserve

In addition to the 76,000 new recruits entering the Air Force via recruiting service in FY 77, 9,249 will join the Air Force via the Air National Guard (ANG) and the Air Force Reserve (AR). These 9,249 new enlistees must also attend Basic Military Training and the vast majority must attend Technical Training, but their impact on BMT and TT is not addressed in this report since it is assumed that no further improvements can be made to stabilize ANG or AR flow.

Recruit Quality

It is also assumed that recruit quality remains stable throughout the year. There are those who would argue, and with some validity, that recruit quality is lowest during the spring and highest during the summer. Determining the appropriate relationship between quality and month of enlistment would itself be a time-consuming effort which is beyond the scope of this study.

Initial Flow Conditions

Each of the alternative recruiting flow patterns discussed in this report are treated as though they were being implemented for the first time beginning with September of FY 77. This technique allows each recruiting flow option to be compared on an "equal start" basis.

IV. RECRUITING INPUT PATTERNS

Optimum Flow - Basic Military Training

From BMT's point of view, the optimum recruiting input pattern is one which provides a stable student population. The measure of stability employed in defining optimum flow is the average of the absolute percentage change in end-of-month to end-of-month student loads. Low values of this measure are associated with a stable student population. In mathematical symbology, this measure of stability is defined as

$$\text{Measure of Stability} = \frac{\sum_{i=o}^{12} \frac{|X_{i+1}-X_i|}{X_i}}{12} \times 100\%$$

where;

X_i = end-of-month flight load for ith month and,

X_o = end-of-month BMT student load for September of FY 7T and

$|X_{i+1}-X_i|$ = absolute value of $X_{i+1}-X_i$.

Two input patterns have generally been regarded as being optimum for BMT: constant monthly flow of new recruits and constant daily flow of new recruits. Due to year-to-year changes in annual recruiting objectives, neither of these patterns will enable BMT to maintain level student loads throughout the year as shown in Figures 1 and 2. Both of

Figure 1

PROJECTED FY 1977 END-OF-MONTH FLIGHT LOADS
CONSTANT DAILY FLOW VS CONSTANT MONTHLY FLOW
BMT AND TT CHRISTMAS POLICIES EXCLUDED

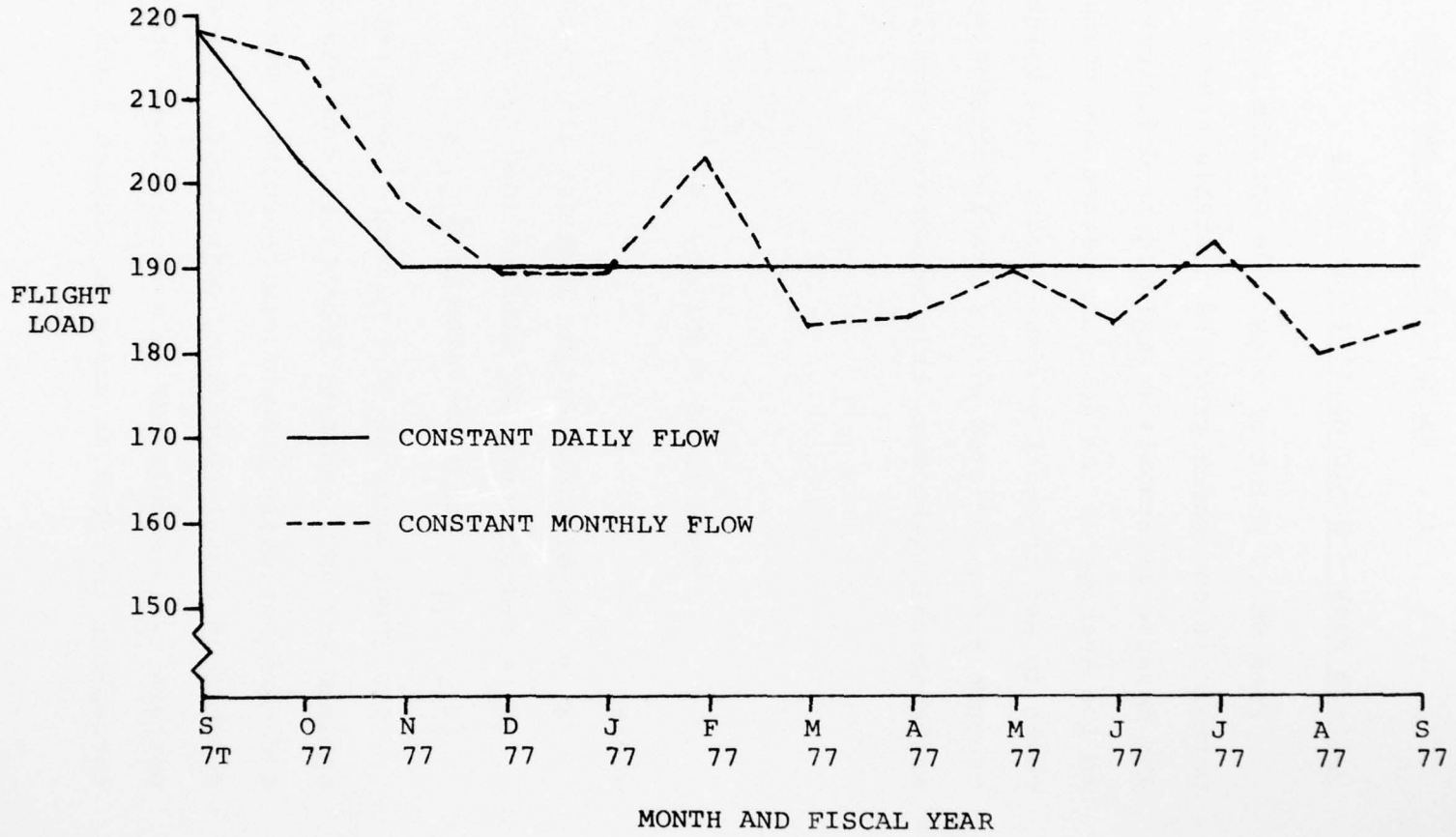
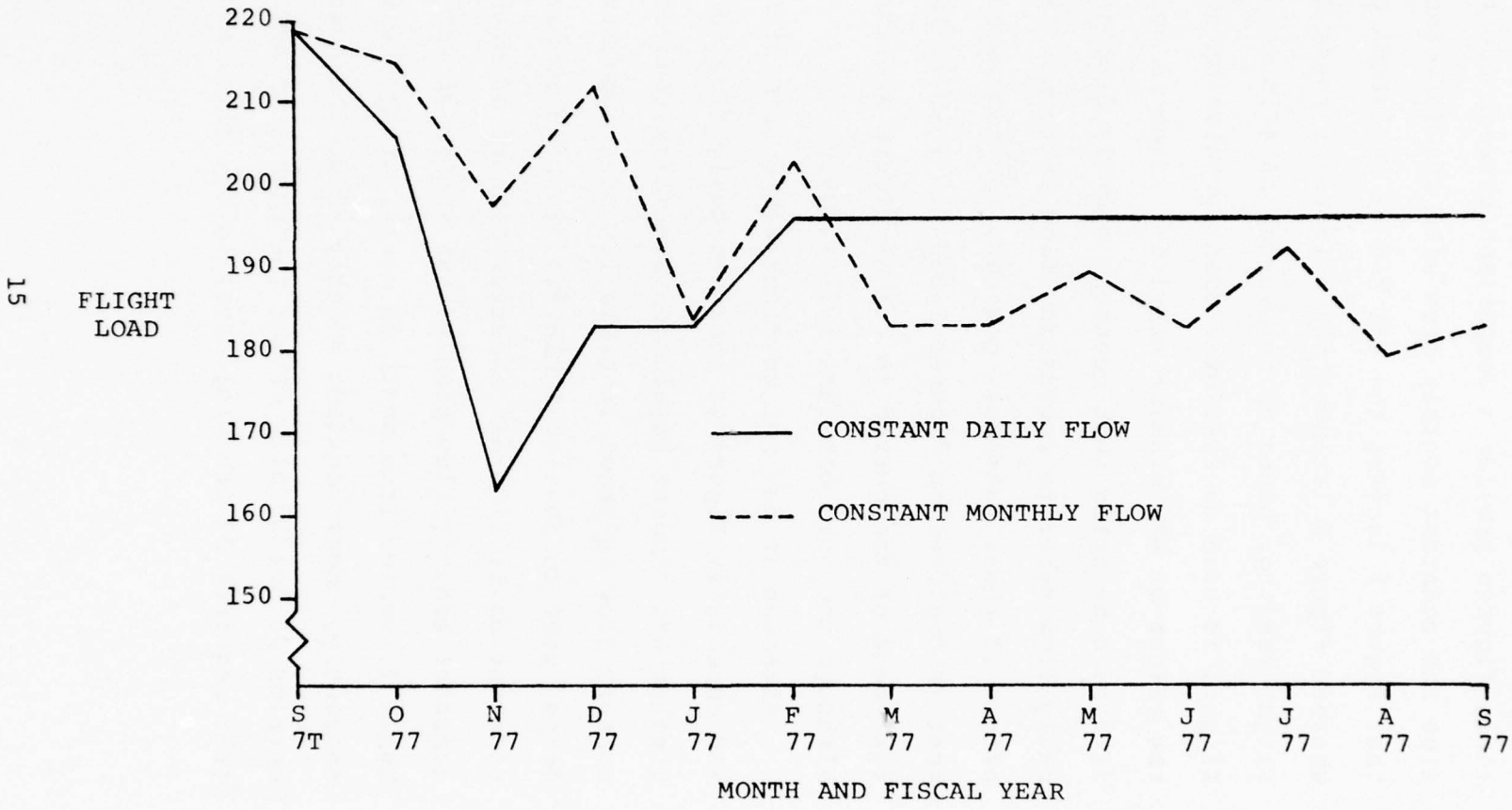


Figure 2

PROJECTED FY 1977 END-OF-MONTH FLIGHT LOADS
CONSTANT DAILY FLOW VS CONSTANT MONTHLY FLOW
BMT AND TT CHRISTMAS POLICIES INCLUDED



these figures provide a comparison between constant daily flow and constant monthly flow with the difference being that Figure 1 ignores the BMT and TT Christmas policies whereas Figure 2 includes the effects of these policies. Flight loading, based on an average of 47.5 students per flight, is used in lieu of student population to nullify the effect of BMT student attrition which is normally 7%. It should be noted that constant monthly flow and constant daily flow refer to recruiting flow patterns. It is the effect of these patterns, however, and not recruiting flow that is depicted in Figures 1 and 2. This is the reason that none of the curves in either figure are straight lines although the word constant implies such.

Although it may not be discernible from either figure, and especially Figure 2, constant daily flow does provide greater BMT student population stability than does constant monthly flow as shown in Table 1. (See Appendix A for methodology used to develop Table 1.) In both comparisons, constant daily flow has a better measure of stability than constant monthly flow because the number of BMT input days, Table 2, varies from month to month during the year. Consequently, under constant monthly flow, the number of BMT entries do not usually offset the number of BMT graduates (BMT requires 32 training days) in any given month.

Table 1

PROJECTED FY 77 END OF MONTH BMT FLIGHT LOAD
CONSTANT DAILY FLOW VS CONSTANT MONTHLY FLOW
(Number of Flights)

Based on 76,000 BMT Entries

		BMT and TT Christmas Policies Excluded		BMT and TT Christmas Policies Included	
Year	Month	Constant Daily Flow	Constant Monthly Flow	Constant Daily Flow	Constant Monthly Flow
FY 7T	Sep	216.0	216.0	216.0	216.0
FY 77	Oct	202.4	215.1	205.8	215.1
	Nov	190.2	197.5	163.3	197.5
	Dec	190.2	190.1	182.9	211.9
	Jan	190.2	190.1	182.9	183.4
	Feb	190.2	202.8	196.0	202.7
	Mar	190.2	183.4	196.0	183.3
	Apr	190.2	183.9	196.0	183.8
	May	190.2	189.9	196.0	189.8
	Jun	190.2	183.5	196.0	183.4
	Jul	190.2	192.7	196.0	192.6
	Aug	190.2	179.9	196.0	179.8
	Sep	190.2	183.6	196.0	183.5
Measure of Stability*		1.0	4.1	3.7	5.9

*Low values imply stability

Table 2

PROJECTED FY 77 BMT ENTRIES PER MONTH AND PER DAY
CONSTANT DAILY FLOW VS CONSTANT MONTHLY FLOW

Based on 76,000 BMT Entries

	Without Xmas Policies					With Xmas Policies				
		Constant Daily Flow		Constant Monthly Flow			Constant Daily Flow		Constant Monthly Flow	
Month	BMT Input Days	Entries Per Month	Entries Per Day	Entries Per Month	Entries Per Day	BMT Input Days	Entries Per Month	Entries Per Day	Entries Per Month	Entries Per Day
Oct	19	5730	302	6333	333	19	5894	310	6333	333
Nov	21	6333	302	6333	302	16	4963	310	6333	396
Dec	21	6333	302	6333	302	19	5894	310	6333	333
Jan	21	6333	302	6333	302	21	6514	310	6333	302
Feb	19	5730	302	6333	333	19	5894	310	6333	333
Mar	23	6937	302	6333	275	23	7135	310	6333	275
Apr	21	6333	302	6333	302	21	6514	310	6333	302
May	21	6333	302	6333	302	21	6514	310	6333	302
Jun	22	6635	302	6333	288	22	6864	310	6333	288
Jul	20	6032	302	6333	317	20	6204	310	6333	317
Aug	21	6937	302	6333	275	21	7135	310	6333	275
Sep	21	6333	302	6333	302	21	6514	310	6333	302

It would appear, then, that because of the inherent balance between input and output in constant daily flow, the graph of this flow pattern in Figure 1 would be a horizontal straight line. Such is not the case because the recent change in fiscal year definition (from July through June to October through September) generated a three month transition period, July through September, in which average daily inputs were much higher than projected average daily inputs for FY 77. Hence, output exceeds input for 32 training days into the new year. This was an exceptional situation since the transition period occurred during the summer months, a period of high recruiting flow.

Under normal circumstances, a change in recruiting flow from one year to the next will cause a dip or rise (reflecting, respectively, a decrease or increase in recruiting flow) in the constant daily flow curve for the succeeding year. If the yearly recruiting objective does not change, the constant daily flow curve for the second year will then be a horizontal straight line. It must be understood, though, that the above arguments apply only to Figure 1.

The constant daily flow curve depicted in Figure 2 can never be a straight line because this curve not only reflects the impact of fiscal year redefinition, but it also reflects the effect of the BMT and TT Christmas policies. Although this flow pattern has a better measure of stability than the

corresponding constant monthly flow, Table 1, the possibility does exist for constant monthly flow to provide greater BMT stability than constant daily flow. In order for this to happen, there would have to be a dramatic decrease in the recruiting objective from one year to the next. Under such circumstances, the high November and December daily inputs generated by the interaction of the BMT and TT Christmas policies with constant monthly flow would tend to dampen the effect of a sharp drop in the total yearly recruiting objective. For the purposes of this report, such circumstances are assumed to be the exception rather than the rule. Consequently, the optimum flow pattern for BMT with the BMT and TT Christmas policies included is defined to be constant daily flow.

Although the BMT and TT Christmas policies are presently a fact of life, the subsequent cost analysis in this report utilizes, as a baseline, the constant daily flow which excludes these policies since this flow option provides maximum BMT student population stability.

FY 77 Programmed Flow

The programmed recruiting input pattern for FY 77 is shown in Table 3. This flow pattern has resulted from continuing efforts by Recruiting Service to flatten the peaks and fill the valleys of the extreme "W" Patterns of past years.

Table 3

FY 77 PROGRAMMED RECRUITING FLOW

Month	Percent Of Annual Goal	Month	Percent Of Annual Goal
Oct	8.3	Apr	7.7
Nov	6.6	May	7.5
Dec	7.1	Jun	9.7
Jan	9.2	Jul	8.9
Feb	8.1	Aug	9.7
Mar	8.6	Sep	8.7

Optimum Flow - Recruiting Service

Defining the optimum recruiting pattern with respect to Recruiting Service is largely a matter of opinion. As an extreme example, some would argue that optimum flow would require sending an entire year's objective to Basic Military Training on the first day of the fiscal year. A less extreme philosophy contends that optimum flow for RS implies maximum possible recruiting for the months of January, February, June, July, August, and September.

Although a specific definition of an optimum recruiting input pattern for Recruiting Service has not been determined, it is generally agreed that such a pattern would be a "W" Pattern with high recruiting objectives in the summer and winter and low objectives in the spring and late fall.

These features are included in the following definition of optimum recruiting flow for RS. The optimum BMT input pattern for Recruiting Service that is employed in this report is defined to be that flow pattern which minimizes month-to-month fluctuations in recruiter requirements. The term recruiter requirements, as used in this report, is not related to manpower allocations, but is rather a function of the average number of recruits a recruiter can bring into the Air Force during any given month. These values, as reported by Recruiting Service, are provided in Table 4. The average number of accessions per recruiter ranges from a low of 3.0 in December to a high of 4.4 in June.

Table 4

AVERAGE NUMBER OF NEW RECRUITS PER RECRUITER

BY MONTH OF ENLISTMENT

Month	Recruiting Accessions Per Recruiter	Month	Recruiting Accessions Per Recruiter
Oct	3.7	Apr	3.2
Nov	3.7	May	3.1
Dec	3.0	Jun	4.4
Jan	4.1	Jul	4.3
Feb	3.5	Aug	4.2
Mar	3.3	Sep	3.9

Using December, the most difficult recruiting month, as the base month, each of the remaining months can afford to have higher recruiting objectives than December without generating increased recruiter requirements. The only question remaining is what should the December recruiting objective be.

If the unknown December objective (percentage basis) is denoted by the letter Z, then, as examples, (3.7/3.0) x (Z) represents the October and November objectives and (4.1/3.0) x (Z) represents the January objective. Also, since the summation of monthly percentages must equal 100%, then Z, the December objective, can be determined as follows:

$$\frac{Z}{3.0} \times (3.7 + 3.7 + 3.0 + 4.1 + 3.5 + 3.3 + 3.2 + 3.1 + 4.4 + 4.3 + 4.2 + 3.9) = 100\%$$

hence;

$$\frac{Z}{3.0} \times (44.4) = 100\%$$

an;

$$Z = 6.77\%.$$

The RS Optimum recruiting flow pattern can now be determined and is reported in Table 5. This recruiting option enables Recruiting Service to meet each monthly objective without juggling the recruiter workload.

Table 5

RS OPTIMUM RECRUITING PATTERN

Month	Percent Of Annual Goal	Month	Percent Of Annual Goal
Oct	8.3	Apr	7.2
Nov	8.3	May	7.0
Dec	6.8	Jun	9.9
Jan	9.3	Jul	9.7
Feb	7.9	Aug	9.5
Mar	7.4	Sep	8.8

Historical "W" Pattern

The Historical "W" Pattern is defined to be the average monthly objective (percentage basis) for male non-prior service enlistees for the ten year period FY 1967-FY 1976. These historical averages as provided by Recruiting Service are shown in Table 6.

Table 6

HISTORICAL "W" PATTERN OF RECRUITING

Month	Percent Of Annual Goal	Month	Percent Of Annual Goal
Oct	8.9	Apr	6.2
Nov	6.9	May	5.9
Dec	4.5	Jun	9.5
Jan	9.9	Jul	10.2
Feb	8.8	Aug	10.8
Mar	7.2	Sep	11.2

Although the ten-year averages pertain to males only, their application is extended to include females since the "W" Pattern applies to females as well as males.

Summary

Optimum recruiting input patterns have been defined for BMT and RS. The optimum pattern for BMT, constant daily flow, has been shown to be affected by the BMT and TT Christmas policies. The BMT Optimum which excludes these Christmas policies is the "Baseline" flow and the BMT Optimum which includes these policies is referred to as the "BMT Optimum with Xmas policies." The RS Optimum recruiting pattern provides for minimum month-to-month variations in recruiter requirements.

The fourth flow pattern discussed was the programmed flow for FY 77. This flow option represents a significant modification of past "W" Patterns. The final recruiting flow option defined in this section was the Historical "W" Pattern, an average of recruiting patterns over the past ten years.

Cost tradeoffs inherent in the above flow patterns are based on the FY 77 recruiting objective of 76,000 new enlistees. Table 7 provides a comparison of the monthly recruiting objectives associated with each pattern and Table 8 compares each pattern based on projected end-of-month BMT flight loads. (See Appendix A for derivation of Table 8.) Cost computations in subsequent sections are based on the data provided in these two tables.

Table 7

MONTHLY RECRUITING (BMT INPUT) OBJECTIVES FOR FY 77

FOR SELECTED RECRUITING FLOW PATTERNS

Based on 76,000 BMT Entries

Month	Baseline*	BMT Optimum With Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
Oct	5730	5894	6296	6333	6764
Nov	6333	4963	5053	6333	5244
Dec	6333	5894	5377	5135	3420
Jan	6333	6514	7000	7018	7524
Feb	5730	5894	6118	5991	6688
Mar	6937	7135	6527	5649	5472
Apr	6333	6514	5880	5477	4712
May	6333	6514	5689	5306	4484
Jun	6635	6824	7339	7532	7220
Jul	6033	6205	6800	7360	7752
Aug	6937	7135	7344	7190	8208
Sep	6333	6514	6577	6676	8512
Total	76000	76000	76000	76000	76000

*BMT Optimum (Constant Daily Flow) which excludes the BMT and TT Christmas Policies.

Table 8

PROJECTED FY 77 END-OF-MONTH BMT FLIGHT LOADS
FOR SELECTED RECRUITING FLOW PATTERNS

Based on 76,000 BMT Entries

Year	Month	Baseline	BMT Optimum With Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
FY 7T	Sep	216.0	216.0	216.0	216.0	216.0
FY 77	Oct	202.4	205.8	217.8	215.2	224.1
	Nov	190.2	163.3	173.7	197.6	179.8
	Dec	190.2	182.9	177.0	187.0	134.9
	Jan	190.2	182.9	191.7	186.3	179.4
	Feb	190.2	196.0	210.7	204.9	225.8
	Mar	190.2	196.0	188.9	165.9	168.9
	Apr	190.2	196.0	179.9	159.4	141.2
	May	190.2	196.0	175.0	159.4	133.4
	Jun	190.2	196.0	202.0	199.1	183.8
	Jul	190.2	196.0	218.0	228.8	233.0
	Aug	190.2	196.0	209.6	208.4	233.2
	Sep	190.2	196.0	202.9	200.2	248.8
Measure Of Stability*		1.0	3.7	7.5	8.3	18.8

*Low values imply stability

V. COST IMPACT ON BASIC MILITARY TRAINING OF SELECTED RECRUITING FLOW PATTERNS

As was shown in the previous section, alternative recruiting flow patterns have varying effects on the average daily student load in Basic Military Training. This variability in student load, in turn, has the potential of affecting the workload of the basic training organization as well as the workload of the Air Force Military Training Center (AFMTC) which supports BMT. This section compares the impact of the five selected recruiting input patterns on Military Training Instructors (MTIs), Base Operating Support (BOS), Real Property Maintenance Activities (RPMA), and other BMT areas which include transportation, utilities and medical support. A final topic addresses management adjustment actions such as workload scheduling, temporary duty (TDY) assignments and leave.

Military Training Instructors

MTI authorizations are currently determined from the following manpower equations:

$$\text{MTI Authorizations} = \text{Max of} \quad \frac{\text{YRO} \times 32 \times 362.82}{252 \times 47.5 \times 144}$$

or

$$\frac{\text{MQRO} \times 32 \times 362.82}{63 \times 47.5 \times 162.605}$$

where YRO = Yearly Recruiting Objective
32 = Length (Training Days) of BMT
362.82 = Instructor Hours Required Per Month Per BMT Flight
252 = Training Days Per Year (Ignores BMT & TT Xmas Policies)
144 = Available Hours Per MTI Per Month

and for the second part of the equation

MQRO = Maximum Quarterly Recruiting Objective
63 = Training Days Per Quarter
162.605 = Available Hours Per MTI Per Month After Adjustments for Leave and Overtime

Table 9 shows the quarterly recruiting objectives for each of the five selected patterns, and Table 10 shows the MTI authorizations associated with each pattern. All recruiting patterns, with the exception of the Historical "W" Pattern would generate authorizations based on the yearly recruiting goal, column (1) of Table 10. The Historical "W" Pattern would require additional authorizations due to the peak BMT input period of July, August, and September. The cost impact of these recruiting patterns with respect to MTIs is provided in Table 11. Note that cost comparisons are made with respect to baseline flow. The $767,000 associated with the Historical "W" Pattern was obtained by multiplying the difference between 584 and 512 by $10,646, the pay cost factor of an E-5, the average grade of an MTI.

Table 9

FY 77 QUARTERLY RECRUITING OBJECTIVES

FOR SELECTED RECRUITING FLOW PATTERNS

Fiscal Quarter	Baseline	BMT Optimum With Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
1/77	18,396	16,751	16,726	17,797	15,428
2/77	19,000	19,543	19,645	18,662	19,684
3/77	19,301	19,852	18,908	18,317	16,416
4/77	19,303*	19,854*	20,721*	21,224*	24,472*

*Maximum Quarterly Recruiting Objective (MQRO)

Table 10

FY 77 MTI AUTHORIZATIONS ASSOCIATED

WITH SELECTED RECRUITING FLOW PATTERNS

Flow Pattern	(1) Authorizations Based on Yearly Recruiting Objective	(2) Authorizations Based on Max Quarterly Recruiting Objective	Number Authorized Max of (1) and (2)
Baseline	512	462	512
BMT Optimum with Xmas Policies	512	474	512
FY 77 Program	512	494	512
RS Optimum	512	506	512
Historical "W" Pattern	512	584	584

Table 11

MTI COST IMPACT OF SELECTED RECRUITING FLOW PATTERNS

FY 77 DOLLARS

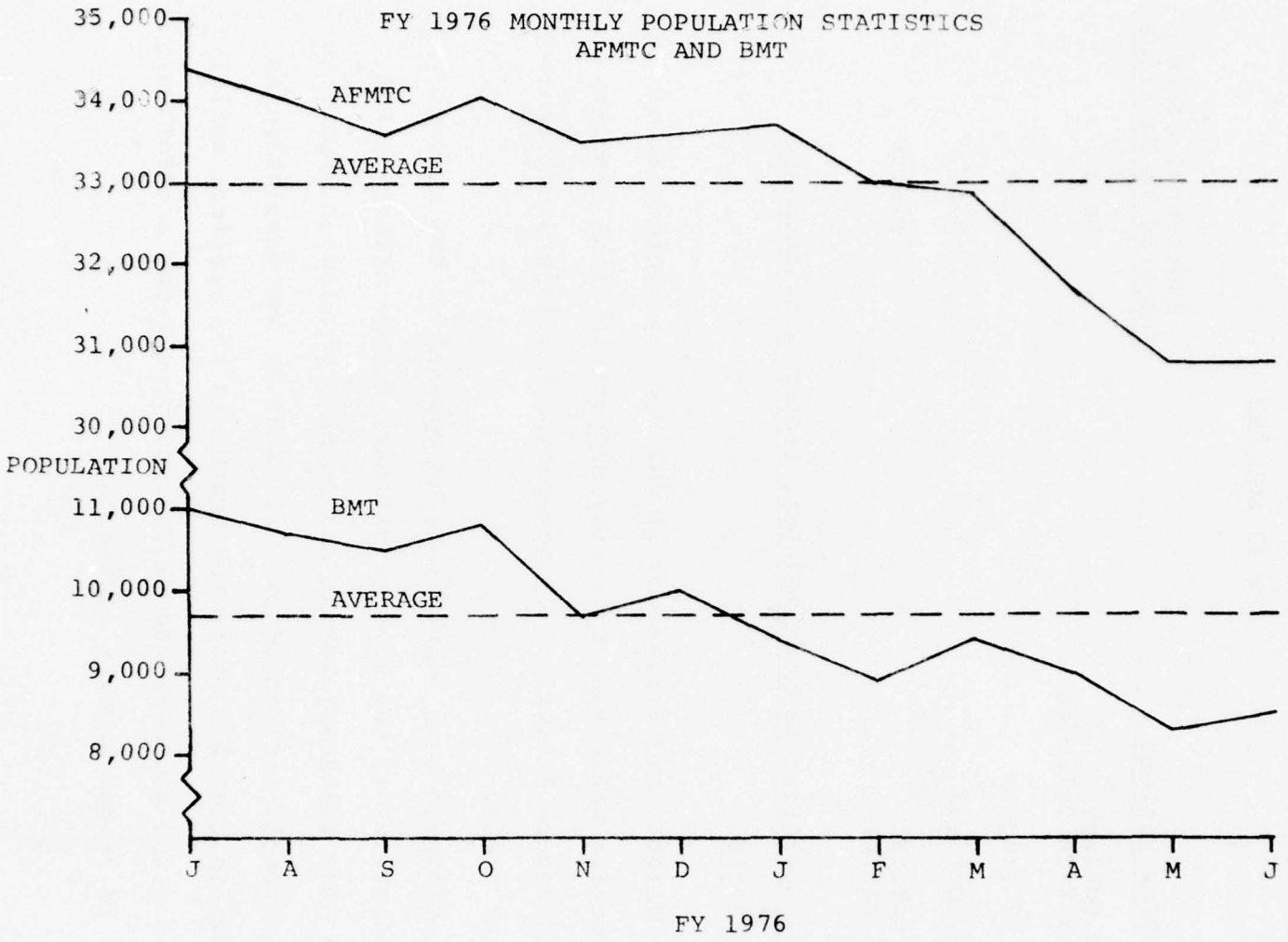
Flow Pattern	Additional Costs Compared to Baseline
BMT Optimum with Xmas Policies	None
FY 77 Program	None
R.S. Optimum	None
Historical "W" Pattern	$767,000

Base Operating Support and Real Property Maintenance Activities

Flight load variations in BMT have the potential of affecting AFMTC Base Operating Support and Real Property Maintenance Activities by generating civilian overtime in these areas.

Although base population, as opposed to BMT student population, is the more significant factor affecting BOS and RPMA workload, variations in base population appear to be strongly influenced by variations in BMT population as shown in Figure 3 (Note the breaks in the vertical scale). This graph compares the FY 76 base population at AFMTC with the FY 76 BMT student population.

Figure 3


FY 1976 MONTHLY POPULATION STATISTICS
AFMTC AND BMT
35,000
34,000
33,000
32,000
31,000
30,000
POPULATION
11,000
10,000
9,000
8,000
AFMTC
AVERAGE
BMT
AVERAGE
J
A
S
O
N
D
J
F
M
A
M
J
FY 1976

Assuming that BOS and RPMA functions are manned on an average workload basis, the potential for civilian overtime in these areas, based on BMT student population, existed during the months of July, August, September, October, and December. During these months, BMT student population exceeded the yearly average of 9,680 by the following respective amounts: 1,300; 900; 860; 1,085; and 300. Using ATC command manpower programming factors and annual pay factors for BOS and RPMA, Table 12, FY 76 potential overtime costs were computed and compared to FY 76 actual civilian overtime expense, Table 13.

Costs associated with potential BOS and RPMA civilian overtime generated by a fluctuating BMT student load in FY 76 is quite large in comparison to actual overtime expenses. Also, the fiscal quarter of maximum potential overtime does not correspond to the fiscal quarter of maximum actual overtime. These differences are explained by the fact that neither Base Operating Support nor Real Property Maintenance Activities are wholly population dependent. Unlike the MTI situation where a significant increase in BMT students prompts an immediate need for MTIs, the BOS and RPMA work centers do not experience a "post haste" situation since their workload can be spread out over time. Consequently, the impact of BMT fluctuations on BOS and RPMA civilian overtime is considered negligible and will not

affect the "additional cost" comparisons of alternative recruiting flow patterns.

Table 12

BOS AND RPMA FACTORS

MANPOWER AND PAY COSTS

FY 77 DOLLARS

	BOS	RPMA
ATC command manpower programming factors (variable cost)	8 BOS Authorizations per 100 students	4 RPMA Authorizations per 1000 students
Distribution of Manpower		
Officer	5%	5%
Enlisted	50%	35%
Civilian	45%	60%
Annual pay factors for civilians	14,400	15,121
Overtime pay factors (1 1/2 x annual pay factor)	21,600	22,682

Table 13

POTENTIAL AND ACTUAL BOS AND RPMA

CIVILIAN OVERTIME FOR FY 76

AIR FORCE MILITARY TRAINING CENTER

FY 77 DOLLARS

Fiscal Quarter	Potential Overtime*	Actual Overtime
1/76	$218,000	$12,000
2/76	96,000	8,000
3/76	0	13,000
4/76	0	27,000

*Based on FY 76 BMT student loads

Transportation

Transportation is not severly handicapped by a fluctuating BMT population since transportation from AFMTC to the appropriate technical training center (TTC) can be arranged for groups of varying sizes on commercial buses or commercial airlines. If a group is not of sufficient size to warrant chartering a bus or airplane, these students will remain at Lackland until the following day when their numbers can be increased via another BMT graduation. Also, transportation on the base is not affected by BMT student loads since the basic trainee's feet are his primary mode of transportation while in training.

Utilities

Utilities are affected by BMT student load fluctuations. As the student population varies, the need for dormitory space also varies. Under such circumstances, two courses of action are possible. First, dormitory buildings can be opened and closed as the need arises. The other alternative is to keep all dormitories open and fill them to less than capacity during slack periods. There are, of course, economic tradeoffs associated with each of these options. Opening and closing buildings generates additional maintenance costs because buildings tend to deteriorate during periods of non-use. These costs have to be weighed against utilities costs associated with excess capacity.

BMT currently follows a policy which is a combination of the two alternatives discussed above. All of the World War II era dormitory buildings are used on an as needed basis whereas all newer facilities are operated year round. Although this policy incurs some of each type expense discussed in the preceding paragraph, it is felt to be the most cost effective method for conducting Basic Military Training.

At the present time, maximum capacity of modern BMT dormitory facilities is 11,000. These facilities consist of nine 1,000-man dormitories, two 600-man dormitories, and

four 200-man dormitories. Estimates of annual utility (gas and electric) costs associated with each of these structures is provided in Table 14. The disproportionally low utilities cost associated with the 200-man dormitory occurs because the larger dormitories contain dining halls whereas the small dormitories do not.

Table 14

ANNUAL UTILITY COST ESTIMATES

FOR BMT DORMITORY FACILITIES

FY 77 DOLLARS

	Gas	Electricity	Total
1000 Man Dormitory	$53,000	$166,000	$219,000
600 Man Dormitory	$32,000	$ 49,000	$ 81,000
200 Man Dormitory	$10,000	$ 7,000	$ 17,000

If Recruiting Service were able to smooth the "W" Pattern, there is a potential for closing one or more of these modern facilities on a permanent basis and thereby reduce utility consumption. Table 15 provides a comparison of required modern dormitory facilities and resultant utility cost comparison for each recruiting flow pattern for FY 77 based on maximum "end-of-month" flight loading. All cost comparisons assume that the smaller dormitories are closed first.

Table 15

ESTIMATED BMT UTILITIES COST IMPACT

OF SELECTED RECRUITING FLOW PATTERNS

(GAS AND ELECTRICITY)

Recruiting Flow Option	Maximum Student Load*	Modern Facilities Required			Additional Cost Compared To Baseline
		1,000-Man Dormitory	600-Man Dormitory	200-Man Dormitory	
Baseline	9,614	9	1	1	-
BMT Optimum with Xmas Policies	9,776	9	1	1	None
FY 77 Program	10,355	9	2	2	$ 81,000
RS Optimum	10,859	9	2	4	$132,000
Historical "W" Pattern	11,780	9	2	4	$132,000

*Obtained by multiplying maximum end-of-month flight load for FY 77, Table 8, by 47.5 students per flight.

The maximum student load generated by the Historical "W" Pattern would require temporary occupation of some of the unairconditioned, WW II dormitories. Because this would occur during the summertime when the weather is warm and daylight hours are long, no significant increase in utilities is expected to occur. Also the cost of temporary utilization of the few buildings required for this purpose is also considered negligible.

Medical Support

Medical support costs are purportedly not significantly affected by those changes in the BMT student population which are generated by the "W" Pattern.

Management Adjustments

The mere fact that the BMT student population follows a "W" Pattern during the fiscal year gives rise to the need for certain management adjustments. Such adjustments include rescheduling of leave or vacation time, altering work schedules, and cancelling temporary duty assignments.

The cost of these adjustments is considered negligible when measured in terms of dollars, but their impact on management can be significant. As an example, if the BMT student load is excessively high during the summer, then

the military training instructors will be allowed to take only minimal leave during the summer months, an optimum leave period because it coincides with school vacations. As a result, management does experience morale problems.

To provide a measure of how management actions are influenced by student load variations, the measure of stability introduced in Section III is used. Defining the baseline flow measure of stability as the unit value, the management adjustment factors assigned to each of the other flow patterns are defined to be:

$$\frac{\text{selected flow pattern measure of stability}}{\text{baseline flow measure of stability}}$$

These factors are reported in Table 16.

Table 16

BMT MANAGEMENT ADJUSTMENT FACTORS

FOR SELECTED RECRUITING FLOW PATTERNS

Recruiting Flow Pattern	Management Adjustment Factor
Baseline	1.0
BMT Optimum with Xmas Policies	3.7
FY 77 Program	7.5
RS Optimum	8.3
Historical "W" Pattern	18.8

Thus, the Historical "W" Pattern requires 18.8 times as many management adjustments as the baseline flow and 2.5 (18.8/7.5) times as many as FY 77 programmed flow.

Summary

This section has examined the effects on BMT and AFMTC caused by fluctuations in BMT student loads. Areas which experienced significant cost impacts include MTIs and utilities. Areas which were not significantly affected are BOS and RPMA, transportation, and medical support. A final area, management adjustments, was addressed via a relative comparison of measures of stability. A numerical summary of the impact of alternative recruiting patterns on BMT/AFMTC functions discussed in this section is provided in Table 17. This numerical summary clearly shows, from BMT's perspective, the excessive costs associated with extreme "W" patterns.

Table 17

SUMMARY-IMPACT OF SELECTED

RECRUITING FLOW PATTERNS ON BMT/AFMTC

FY 77 DOLLARS

Additional Costs Compared to Baseline

	BMT Optimum with Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
MTIs	$0	$0	$0	$767,000
Utilities	0	$81,000	$132,000	$132,000
BOS & RPMA	0	0	0	0
Transportation	0	0	0	0
Medical Support	0	0	0	0
Total Dollar Costs	$0	$81,000	$132,000	$899,000
Management Adjustment Factors	3.7	7.5	8.3	18.8

*All cost data is additive; management adjustment factors are multiplicative.

VI. COST IMPACT ON TECHNICAL TRAINING OF SELECTED RECRUITING FLOW PATTERNS

BMT Graduate Non-Productive Time

As new recruits graduate from Basic Military Training, the vast majority, approximately 94%, are sent to formal Technical Training courses. In order to have a smooth transition from BMT to TT, course start dates in Technical Training must be synchronized with BMT graduation dates and, consequently, BMT entry dates. If BMT entries occurred independently of TT course start dates, then considerable nonproductive time would be generated. Nonproductive time is defined to be the time differential between BMT graduation and entry into Technical Training.

To estimate the cost of nonproductive time associated with each recruiting flow option, BMT output for each "Academic Month" (20 consecutive training days) in FY 77 is compared to TT demand for students in the corresponding time frame. The academic month is used in lieu of the calendar month as a basis for comparison because course start dates in Technical Training are based on an academic week of five consecutive training days. If calendar months were used, the differing number of training days per month would incorrectly portray month-to-month fluctuations in the TT demand for BMT output.

The BMT graduate inventory, as used in the context of this discussion, should not be confused with the "Casual Student" or "Pre-Technical Training Student" (PTTS) problems. Casual Students and PTTS are totally separate issues from the BMT graduate inventory. The magnitude of the Casual Student or PTTS population is not necessarily a function of recruiting flow.

Although 12 academic months consist of only 240 training days as opposed to the normal 245-247 training days per year, this difference will not affect the analysis since supply shortfalls are used to determine the costs of the BMT graduate inventory. Supply shortfalls do not occur at the end of the fiscal year. See Table 18.

Table 18 compares FY 77 BMT output for each recruiting flow pattern with projected FY 77 TT demand for BMT graduates. For each of the five recruiting patterns, the number of academic months in which supply exceeds demand is greater than the number of months when the opposite is true. Also, the total supply is greater than total demand. These disparities are due to the fact that TT demands only 94% of BMT output. The remaining 6% of BMT graduates receive directed duty assignments. The TT demand data in Table 18 was provided by ATC/TT. BMT output data was derived as described in Appendix B.

Table 18

FY 77 PROJECTIONS OF SUPPLY

VERSUS DEMAND FOR BMT GRADUATES

		BMT OUTPUT OR SUPPLY				
Month	TT Demand	Baseline	BMT Optimum with Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
Oct	5840	6251	6251	6251	6251	6251
Nov	5725	6102	6160	6327	6345	6510
Dec	5150	5602	5481	5740	6355	6080
Jan	4975	5602	5770	5507	5960	(4447)
Feb	4880	5602	5193	5252	5180	(4837)
Mar	5175	5602	5770	6094	6043	6606
Apr	5070	5602	5770	5599	5152	5380
May	5140	5602	5770	5251	(4681)	(4324)
Jun	5225	5602	5770	(5148)	(4798)	(4103)
Jul	5280	5602	5770	5388	(5201)	(4611)
Aug	5200	5602	5770	6229	6465	6326
Sep	5250	5602	5770	6247	6640	7095

Name of Month = academic training month consisting of 20 training days

( ) = month of supply shortfall

To obtain a relative cost comparison between alternative recruiting patterns, the periods in which demand exceeds supply are used as a comparison basis. This methodology eliminates the need for concern over the difference in total training days between academic months and calendar months. It also avoids inadvertent inclusion of DDA students in the BMT graduate inventory.

If it is assumed that all Technical Training seats are to be filled each academic month, then an inventory of BMT graduates must be established prior to those periods when TT demand exceeds supply. The costs of nonproductive time generated by such actions are given in Table 19. These cost comparisons, like those in previous sections, are in relation to Baseline flow. (See Appendix B for derivation of non-productive time costs.)

A question may arise concerning the validity of the assumption that all TT seats must be filled. Technical Training is required to meet specific trained personnel requirements each year and cannot allow a large number of school seats to go unfilled.

There may also be some question concerning the comparison of the Baseline supply curve to the TT demand curve since Baseline flow ignores the TT Christmas policy and the TT demand curve is based on this policy. If the Technical Training demand curve were adjusted to correct for the TT

Christmas policy, it is expected that monthly TT demand would decrease slightly in the January - April time frame because the total annual requirement while remaining constant would be spread out over 5-7 additional training days. Thus, the affect of adjusting the TT demand curve to exclude the TT Christmas break would be insignificant.

Table 19

BMT GRADUATE NONPRODUCTIVE TIME

COSTS FOR SELECTED

RECRUITING FLOW PATTERNS

FY 77 DOLLARS

Flow Pattern	Additional Costs Compared to Baseline
BMT Optimum with Xmas POLICIES	None
FY 77 Program	$ 39,000
RS Optimum	$1,253,000
Historical "W" Pattern	$5,664,000

Technical Training Instructors

If Technical Training were to alter its program so that TT demand was responsive to BMT output, then dramatic variations in the supply of BMT graduates would no longer generate a BMT graduate inventory. The impact on Technical Training instructors, however, could be severe. During extreme

shortfalls, instructors would experience underutilization, and during peak supply periods, overtime would be required. It is also possible that extreme peaks may generate a need for additional TT instructors in a manner similar to the Military Training Instructor manning situation discussed in Section V. It should be pointed out, however, that the impact of RS Optimum flow and the Historical "W" Pattern on TT instructors would likely be less severe than the impact on MTIs for the following reasons: only 94% of BMT graduates attend formal training courses; BMT is taught at a single location whereas Technical Training is divided among five locations; there are approximately 300 initial skills Technical Training courses as opposed to a single BMT course; and Technical Training has a variable class size structure which provides a limited surge capability.

At the present time, there is no adequate mechanism for determining additional TT instructor requirements that might be generated by the Historical "W" Pattern or RS Optimum flow. Technical Training instructor authorizations are determined via a smoothing process which is based on an average workload. In addition, many of the instructors who teach new enlistees also teach higher ranking airmen and noncommissioned officers in the advanced and supplemental Technical Training courses. Thus, one can only speculate about the TT instructor implications of flowing new enlistees into Technical Training

according to the Historical "W" Pattern or RS Optimum flow. Hence, the cost of the BMT graduate inventory will be used to assess the impact of alternative recruiting options on Technical Training.

Support Services and Utilities

It is reasonable to expect the "W" Pattern to affect support services and utilities at the technical training centers in much the same way as the "W" Pattern affects similar activities at BMT. There is an impact, but it is much less severe than that experienced by BMT. There are two reasons for this. First of all, not all BMT graduates attend formal training courses; and, secondly, there are five technical training locations to which BMT graduates are dispersed. Thus, the impact of the "W" Pattern on a single TTC is small when compared to the impact on BMT. As a result, the cost impact of the "W" Pattern on support services and utilities at the TTCs is considered to be negligible.

Management Adjustments

Management problems generated at the technical training centers by the "W" Pattern are assumed to be of much less magnitude than the management problems experienced by BMT

because the BMT graduate inventory acts as a buffer which shields Technical Training from recruiting flow fluctuations. Also, DDAs, five different training locations, 300 different courses of varying lengths, and a variable class size structure all provide additional buffers for Technical Training that BMT does not possess. Consequently, the need for large-scale workload adjustments at the TTCs does not appear to be necessary and no management adjustment factor is developed for Technical Training.

Summary

This section has addressed the cost impact of alternative recruiting flow options on Technical Training. Significant cost differences were found to exist among recruiting alternatives with respect to the BMT graduate inventory. The discussion relating to effects of the "W" Pattern on TT instructors stressed the significance of this consideration but a dollar cost was not attached to it. The effect of the "W" Pattern on support services and utilities was also discussed. Cost differences associated with these functions were assumed to be insignificant. Finally, the impact of the "W" Pattern on management adjustments was examined resulting in the conclusion that TT management adjustments are insignificant when weighed against BMT management adjustments.

VII. COST IMPACT ON RECRUITING SERVICE OF SELECTED RECRUITING FLOW PATTERNS

Although the "W" Pattern of recruiting runs contrary to the desires of the ATC training community, it does enable Recruiting Service to hold down recruiting costs. This section addresses the positive aspects of the "W" Pattern by comparing recruiting costs associated with each of the five selected recruiting flow patterns.

Recruiters

The number of recruiters needed to recruit a given number of new airmen varies from month to month as a function of recruit availability. For example, a June recruiting objective of 6,000 could be achieved by fewer recruiters than a December recruiting objective of the same magnitude. The average number of new enlistees a recruiter can bring into the service in any given month is provided in the second column of Table 20. Also included in Table 20 are monthly recruiter requirements for the five recruiting flow options being examined. The monthly recruiter requirements were determined by dividing the recruits per recruiter factor into the appropriate monthly recruiting objective taken from Table 7. As a point of further clarification,

Table 20

RECRUITER REQUIREMENTS ASSOCIATED

WITH SELECTED RECRUITING FLOW PATTERNS

Month	Recruiting Accessions Per Recruiter	RECRUITER REQUIREMENTS				
		Baseline	BMT Optimum With Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
Oct	3.7	1549	1593	1702	1712	1828
Nov	3.7	1711	1341	1366	1712	1417
Dec	3.0	2111	1965	1792	1712	1140
Jan	4.1	1545	1589	1707	1712	1835
Feb	3.5	1637	1684	1748	1712	1910
Mar	3.3	2102	2162	1978	1712	1658
Apr	3.2	1979	2036	1838	1712	1473
May	3.1	2043	2101	1835	1712	1446
Jun	4.4	1508	1550	1668	1712	1640
Jul	4.3	1403	1443	1581	1712	1802
Aug	4.2	1652	1699	1749	1712	1954
Sep	3.9	1624	1670	1686	1712	2182
Average Yearly Recruiter Requirement		1739	1736	1718	1712	1690

Table 20 reflects monthly recruiter requirements, not monthly recruiting objectives.

Since Recruiting Service receives manpower authorizations according to annual workload rather than month-to-month workload, yearly average recruiter requirements form the basis for making cost comparisons. These comparisons, Table 21, are depicted as negative additional costs because the baseline flow has the highest yearly average recruiter requirement. The cost data were obtained by multiplying the difference in recruiter requirements compared to baseline flow by $12,509, the pay cost factor of an E-6, the average grade of an Air Force recruiter.

Table 21

RECRUITER COST IMPACT OF

SELECTED RECRUITING FLOW PATTERNS

FY 77 DOLLARS

Flow Pattern	Additional Cost Compared to Baseline
BMT Optimum With Xmas Policies	($ 38,000)*
FY 77 Program	($263,000)
RS Optimum	($338,000)
Historical "W" Pattern	($613,000)

*( ) Denotes a Negative Additional Cost

There may be some question concerning the use of yearly average recruiter requirements without considering peak workload periods as was the case with Military Training Instructors. Averages are used because there is no recruiting manpower adjustment for peak recruiting periods and because the average yearly recruiter requirement for the FY 77 Program, 1718, shown in Table 20 does not differ significantly from the 1712 recruiter spaces actually authorized for FY 77. It should be pointed out, however, that Recruiting Service feels there should be an adjustment for peak workload periods and that the adjustment should be predicated on a 144 manhour month rather than the 162 manhour month which is employed in the MTI peak workload equation.

Advertising and Travel

Recruiting Service feels that as they move from the "W" Pattern toward a smooth recruiting flow, their advertising costs will rise. Their argument is based on the assumption that the return (enlistments) per advertising dollar is greatest during those months that coincide with high school gradutions. The tradeoff here is essentially the same as it is for recruiters.

Although the above argument is intuitively appealing, there is no data by which RS can determine the advertising cost per enlistee on a monthly basis. Recruiting Service

does utilize a survey form which addresses the effectiveness of advertising as one of a number of enlistment decision factors, but the survey makes no distinction concerning the time interval between the advertisement and subsequent enlistment. As a result, it is not known whether an enlistee is responding to recent advertising, or to advertising of earlier months, or to a series of advertisements.

In spite of the nonavailability of data, it is reasonable to assume that advertising costs are a function of the "W" Pattern and tend to offset those savings which accrue to the training community as a result of smooth recruiting flow. The extent to which advertising costs offset savings cannot, of course, be quantified, but it is an element worthy of consideration when selecting a recruiting flow pattern.

Travel expenses associated with recruiting are affected in much the same way as advertising. During difficult recruiting months, recruiters have to "beat the bushes" more than they do during the easier recruiting months. If the months of April, May, and December are to have higher recruiting objectives at the expense of the lucrative recruiting months, total travel expenses would probably increase. Again, like advertising expenses, a valid data base does not exist whereby average travel expenses per enlistee per month can be determined.

Payment of Bonuses to Delayed Enlistees

An alternative by which Recruiting Service could increase recruiting flow during December, April, and May would be to pay bonuses to those who delayed enlistment in order to enter BMT during these months. Payment of the bonus would be contingent upon the enlistee completing Basic Military Training. Baseline flow would require 18,999 December, April, and May enlistees whereas Constant Daily Flow with the Christmas policies would require 18,922. After BMT attrition adjustments, bonuses would be owed to 17,669 and 17,597 respectively.

Various bonus options and their respective costs are shown in Table 22. Clearly, this alternative is undesirable. Bonus payments of $10 or $25 per enlistee will not attract many prospects and reasonable bonus payments such as $100 are cost prohibitive. Consequently, recruiter costs are the more appropriate measure for determining the impact of alternative recruiting options on the recruiting force.

Management Adjustments

Assigning recruiters to recruiting service based on a yearly average requirement implies that there will be peaks and valleys in the workload. Management will necessarily

Table 22

COST OF DELAYED ENLISTMENT BONUS OPTIONS

FOR DECEMBER, APRIL, AND MAY ENLISTEES

	Number of Enlistees	Number Completing BMT	Bonus Option $10	Bonus Option $25	Bonus Option $100
Baseline Flow	18,999	17,669	$176,690	$441,725	$1,766,900
Constant Daily Flow With BMT & TT Xmas Policies	18,922	17,597	$175,970	$439,937	$1,759,700

have to make adjustments if recruiting objectives for each month are to be achieved.

Unlike the BMT situation where management adjustment factors were based on workload, flights on board, Recruiting Service management adjustment factors must be based on recruiter requirements. This results from the fact that the average number of recruits per recruiter varies by month whereas MTI manning per BMT flight remains constant.

The methodology employed to compute management adjustment factors for Recruiting Service is based on maximum and minimum recruiter requirements adjusted for baseline flow. In mathematical symbology, the adjustment factor is

$$\frac{R_{max} - R_{min}}{R_{max(B)} - R_{min(B)}}$$

where:

R_{max} = maximum monthly recruiter requirement;

R_{min} = minimum monthly recruiter requirement; and

(B) = maximum or minimum requirement under baseline flow.

Other computational methodologies were examined but none presented any dramatic differences from the method employed. These factors are reported in Table 23.

Table 23

RECRUITING SERVICE MANAGEMENT ADJUSTMENT FACTORS

FOR SELECTED RECRUITING FLOW PATTERNS

Recruiting Flow Pattern	Management Adjustment Factor
Baseline	1.0
BMT Optimum with Xmas Policies	1.2
FY 77 Program	0.9
RS Optimum	zero
Historical "W" Pattern	1.5

Thus, FY 77 program flow requires 90% of the adjustments that baseline flow requires and 60% of the adjustments that the Historical "W" Pattern requires.

When compared to RS Optimum flow, all other recruiting alternatives require significantly more management adjustments. A quantifiable relationship is not possible here because division by zero is not defined.

It must be understood that the above factors can only be compared to one another within the recruiting arena. There is no clear relationship between management adjustment factors for Recruiting Service and management adjustment factors for BMT.

Summary

This section has examined the effect of alternative recruiting flow patterns on Recruiting Service. Based on average yearly recruiter requirements, the Historical "W" Pattern was found to be most cost effective. Advertising and travel expenses, although not addressed quantitatively, also appear to be a function of the "W" Pattern. Payment of bonuses to those who enlist during December, April, and May was considered as a method of stabilizing BMT inputs but reasonable bonus options are cost prohibitive. Finally, management adjustment factors were computed for each recruiting flow pattern. No vast differences existed here with the exception that RS Optimum flow requires no management adjustments at all.

VIII. COST IMPACT ON ATC OF SELECTED RECRUITING FLOW PATTERNS

This section provides a consolidation of the effects of the "W" Pattern on Basic Military Training, Technical Training and Recruiting. These effects are summarized in Table 24.

On a monetary cost basis, the FY 77 program flow is the most cost effective recruiting pattern and the Historical "W" Pattern is the least cost effective flow. When management adjustments are introduced, the baseline flow minimizes management adjustments for BMT whereas RS Optimum flow minimizes management adjustments for Recruiting Service.

When all quantifiable factors are considered, the Historical "W" Pattern and RS Optimum are clearly undesirable options, but there is no overwhelming evidence by which any of the remaining recruiting alternatives could be selected as being optimum for ATC. Each is obviously superior to RS Optimum and the Historical "W" Pattern, but that is the only clear distinction resulting from this analysis. Fundamental differences among the Baseline, BMT Optimum with Xmas policies, and FY 77 program flow involve tradeoffs between dollars and management adjustments.

Table 24

SUMMARY - IMPACT OF SELECTED

RECRUITING FLOW PATTERNS ON ATC

FY 77 DOLLARS

	Additional Costs Compared to Baseline*			
	BMT Optimum with Xmas Policies	FY 77 Program	RS Optimum	Historical "W" Pattern
BMT/AFMTC Dollar Costs				
MTIs	$0	$0	$0	$ 767,000
Utilities	0	81,000	132,000	132,000
BOS & RPMA	0	0	0	0
Transportation	0	0	0	0
Medical Support	0	0	0	0
TT Dollar Costs				
BMT Graduate Nonproductive Time	$0	$39,000	$1,253,000	$5,664,000
RS Dollar Costs				
Recruiters	($38,000)	($263,000)	($338,000)	($613,000)
Total Dollar Costs	($38,000)	($143,000)	$1,047,000	$5,950,000
BMT Management Adjustment Factors	3.7	7.5	8.3	18.8
RS Management Adjustment Factors	1.2	0.9	zero	1.5

*All cost data is additive; management adjustment factors are multiplicative.

IX. FINDINGS

This report has clearly demonstrated that both the Historical "W" Pattern and RS Optimum flow are inferior recruiting flow options when compared to either Baseline flow, BMT Optimum with Christmas Policies, or the FY 77 Program. Of these three remaining flow patterns, none stands out as being an obviously better recruiting option than the other two alternatives. If, however, some nonquantifiable decision criteria are examined, the FY 77 Program becomes an attractive alternative.

Baseline flow can be dropped from consideration because it excludes the effects of the BMT and TT Christmas policies. These policies are expected to remain in effect for the foreseeable future. Thus, the choice is narrowed to BMT Optimum with Xmas Policies, hereafter referred to as BMT Optimum, and the FY 77 Program.

The FY 77 Program, when compared to BMT Optimum, requires more BMT management adjustments, but is less expensive and requires fewer RS management adjustments. Besides these quantifiable characteristics, there are other factors which should be considered.

The FY 77 Program travels a familiar path because it follows a "W" pattern. There are not many, if any, unknowns associated with such a flow option. BMT Optimum

flow, however, requires exploration of new and unfamiliar territory which raises a number of questions about various unknowns. For example, will increased recruiting objectives for the months of April, May, and December result in a tradeoff between recruit quantity and recruit quality during these months? Also, will the advertising and travel expenses of recruiting increase significantly under BMT Optimum flow? Answers to these and similar questions would certainly provide a better delineation between the FY 77 Program and BMT Optimum, but the data base required to quantify such decision inputs is not available.

Selection of the FY 77 Program as a better recruiting flow alternative than BMT Optimum does not imply that the FY 77 Program is the single "best" recruiting option. The "best" flow pattern may be a smoother flow than the FY 77 Program or it may require more of a "W" pattern than already exists in the FY 77 Program. The point is, however, that recruiting/training tradeoffs are an essential decision ingredient and that the FY 77 Program is in the set of acceptable alternatives.

APPENDIX A

PROJECTION OF FY 77 BMT END-OF-MONTH FLIGHT LOADS

BMT end-of-month flight loads for FY 77 are determined according to the following equation:

$$EOM_i = EOM_{i-1} + INPUT_i - OUTPUT_i$$

where:

i ranges from 1 to 12;

EOM_o = 216 (September of FY 7T EOM flight load);

EOM_i = End-of-month flight load for i^{th} month;

EOM_{i-1} = End-of-month flight load of previous month;

$INPUT_i$ = Number of flights entering BMT during i^{th} month; and

$OUTPUT_i$ = Number of flights completing BMT during i^{th} month.

Since Basic Military Training requires 32 training days, the outputs in any given month were inputs during the previous two months. The fundamental factor for determining end-of-month flight loading is the number of flights per day which enter BMT. Flights per day, denoted FPD, in a given month is computed according to the following equation:

$$FPD = \frac{\text{Monthly Recruiting Objective}}{\text{BMT Input Days Per Month X 47.5 Students Per Flight}}$$

Thus, if a monthly recruiting objective for October (19 BMT input days) were 6000, the FPD would be 6.65. Monthly recruiting objectives are reported in Table 5.

Computing inputs for a particular month is relatively simple. FPD is multiplied by BMT input days. Computation of outputs is a bit more complicated. BMT training days, not BMT input days, in a particular month must be related via the length of BMT training (32 training days) to corresponding BMT input days in previous months. For example, flights entering BMT during the last eleven input days in August and the first eight input days in September complete BMT during the 19 training days in October. Therefore, the October output would be computed as follows:

October Output = 11 X *FPD (AUG)* + 8 X *FPD (SEP)*.

Recruiting objectives, BMT input days, and BMT training days for August and September of FY-7T are given in Table A-1.

Table A-1

BMT INPUT DATA FOR AUGUST AND SEPTEMBER OF FY-7T

	Recruiting Objective	BMT Input Days	BMT Training Days
August	7206	22	22
September	7267	21	21

Table A-2 shows the input and output relationships for each month of FY 77 that were used to compute Baseline flow. Table A-3 shows the input-output relationships for those months that are affected by the BMT and TT Christmas policies. Thus, Tables A-2 and A-3 are utilized in computing end-of-month flight loads for all recruiting flow patterns other than Baseline flow.

Table A-2

BMT INPUT-OUTPUT RELATIONSHIPS FOR BASELINE FLOW

BY CALENDAR MONTH FOR FY 77

Month	BMT Input Days	BMT Training Days	BMT Input	BMT Output
Oct	19	19	19 X FPD (OCT)	11 X FPD (AUG) + 8 X FPD (SEP)
Nov	21	21	21 X FPD (NOV)	13 X FPD (SEP) + 8 X FPD (OCT)
Dec	21	21	21 X FPD (DEC)	11 X FPD (OCT) + 10 X FPD (NOV)
Jan	21	21	21 X FPD (JAN)	11 X FPD (NOV) + 10 X FPD (DEC)
Feb	19	19	19 X FPD (FEB)	11 X FPD (DEC) + 8 X FPD (JAN)
Mar	23	23	23 X FPD (MAR)	13 X FPD (JAN) + 10 X FPD (FEB)
Apr	21	21	21 X FPD (APR)	9 X FPD (FEB) + 12 X FPD (MAR)
May	21	21	21 X FPD (MAY)	11 X FPD (MAR) + 10 X FPD (APR)
Jun	22	22	22 X FPD (JUN)	11 X FPD (APR) + 11 X FPD (MAY)
Jul	20	20	20 X FPD (JUL)	10 X FPD (MAY) + 10 X FPD (JUN)
Aug	23	23	23 X FPD (AUG)	12 X FPD (JUN) + 11 X FPD (JUL)
Sep	21	21	21 X FPD (SEP)	9 X FPD (JUL) + 12 X FPD (AUG)

Table A-3

ADJUSTMENTS TO TABLE A-2

GENERATED BY THE BMT AND TT CHRISTMAS POLICIES

Month	BMT Input Days	BMT Training Days	BMT Input	BMT Output
NOV*	16	21	16 X FPD (NOV)	13 X FPD (SEP) + 8 X FPD (OCT)
DEC*	19	21	19 X FPD (DEC)	11 X FPD (OCT) + 5 X FPD (NOV) + 5 X ZERO
JAN	21	21	21 X FPD (JAN)	11 X FPD (NOV) + 10 X FPD (DEC)
FEB	19	19	19 X FPD (FEB)	9 X FPD (DEC) + 2 X ZERO + 8 X FPD (JAN)

*FPD values for these months must be adjusted due to the reduction in BMT input days

APPENDIX B

DERIVATION OF BMT GRADUATE NONPRODUCTIVE TIME COSTS

Nonproductive time costs are computed for those months in FY 77 when TT demand for BMT graduates exceeds BMT output. This situation occurs with the FY 77 Program flow, RS Optimum flow, and the Historical "W" Pattern.

Table B-1 provides the BMT output equations for each academic month of FY 77. BMT output for an "academic" month is determined in similar fashion to BMT output for end-of-month flight loading, Appendix A. The center column of Table B-1 computes "academic" month output for Baseline flow and the right-most column computes output for the four remaining recruiting flow alternatives. Flights per day (FPD) is computed exactly as described in Appendix A.

When the measure of BMT output in terms of flights is known, the number of flights must be multiplied by 47.5 to obtain the number of students. The number of students, in turn, must be adjusted for attrition (7%) to determine the BMT output as shown in Table 18 of Section VI.

Once BMT output is computed, an adjustment for Directed Duty Assignments must be determined. Although approximately 6% of BMT graduates receive DDAs, it is assumed that no directed duty assignments are given when the need for a BMT

graduate inventory exists. Thus, no adjustments for DDAs are made for those months when all BMT graduates are needed to fill Technical Training seats.

The Historical "W" Pattern is used as an example to show how nonproductive time costs were computed. Calculation of BMT graduate inventory levels for the Historical "W" Pattern, as well as time spent in the inventory, are shown in Table B-2. In order to fill all technical training seats during consecutive months of supply shortfalls, it is necessary to begin building an inventory up to six months prior to the demand for that inventory. Based on a first in - first out flow, BMT graduates would spend from one to six academic months awaiting a technical training seat. The cost of BMT graduate nonproductive time generated by the Historical "W" Pattern, Table B-3, is $5,664,000.

Table B-1

BMT OUTPUT EQUATIONS FOR THE ACADEMIC MONTHS OF FY 77

Academic Month (20 Training Days)	BMT Output Excluding BMT & TT Xmas Policies	BMT Output With BMT & TT Xmas Policies
Oct	11 X FPD (Aug) + 9 X FPD (Sep)	11 X FPD (Aug) + 9 X FPD (Sep)
Nov	12 X FPD (Sep) + 8 X FPD (Oct)	12 X FPD (Sep) + 8 X FPD (Oct)
Dec	11 X FPD (Oct) + 9 X FPD (Nov)	11 X FPD (Oct) + 8 X FPD (Nov) + 1 X ZERO
Jan	12 X FPD (Nov) + 8 X FPD (Dec)	8 X FPD (Nov) + 12 X FPD (Dec)
Feb	13 X FPD (Dec) + 7 X FPD (Jan)	7 X FPD (Dec) + 2 X ZERO + 11 X FPD (Jan)
Mar	14 X FPD (Jan) + 6 X FPD (Feb)	10 X FPD (Jan) + 10 X FPD (Feb)
Apr	13 X FPD (Feb) + 7 X FPD (Mar)	9 X FPD (Feb) + 11 X FPD (Mar)
May	16 X FPD (Mar) + 4 X FPD (Apr)	12 X FPD (Mar) + 8 X FPD (Apr)
Jun	17 X FPD (Apr) + 3 X FPD (May)	13 X FPD (Apr) + 7 X FPD (May)
Jul	18 X FPD (May) + 2 X FPD (Jun)	14 X FPD (May) + 6 X FPD (Jun)
Aug	20 X FPD (Jun)	16 X FPD (Jun) + 4 X FPD (Jul)
Sep	20 X FPD (Jul)	16 X FPD (Jul) + 4 X FPD (Aug)

* Flights per day (FPD) for these months are dependent on whether or not the BMT & TT Xmas policies are included.

Oct = Academic month

Table B-2

BMT GRADUATE INVENTORY ASSOCIATED WITH THE HISTORICAL "W" PATTERN

Academic Month Of BMT Graduation	BMT Output	TT Demand	Output Less Demand	BMT Graduate Inventory	Length Of Time In Inventory		
					Number	Month Of TT Entry	"Academic" Months In Inventory
Nov	6510	5725	785	507	507	Jan	2
Dec	6080	5150	930	1437	21	Jan	1
					43	Feb	2
					816	May	5
					50	Jun	6
Jan	4447	4975	(528)	909	0	-	-
Feb	4837	4830	(43)	866	0	-	-
Mar	6606	5175	1431	2297	1072	Jun	3
					359	Jul	4
Apr	5380	5070	310	2607	310	Jul	3
May	4324	5140	(816)	1791	0	-	-
Jun	4103	5225	(1122)	669	0	-	-
Jul	4611	5280	(669)	0	0	-	-

Nov = Academic month

Table B-3

COST OF BMT GRADUATE INVENTORY ASSOCIATED WITH THE HISTORICAL "W" PATTERN

FY 77 DOLLARS

Length of Time In Inventory "Academic" Months	Training Days	Number Of BMT Graduates	Nonproductive Time In Training Days	Cost Per Training Day*	Cost of Nonproductive Time
1	20	21	420	$25.55	$ 11,000
2	40	550	22,000	25.55	562,000
3	60	1382	82,920	25.55	2,119,000
4	80	359	28,720	25.55	734,000
5	100	816	81,600	25.55	2,085,000
6	120	50	6,000	25.55	153,000
Totals			221,660		$5,664,000

*Annual pay rate of an E-1 ($6,313) divided by 247 training days per year